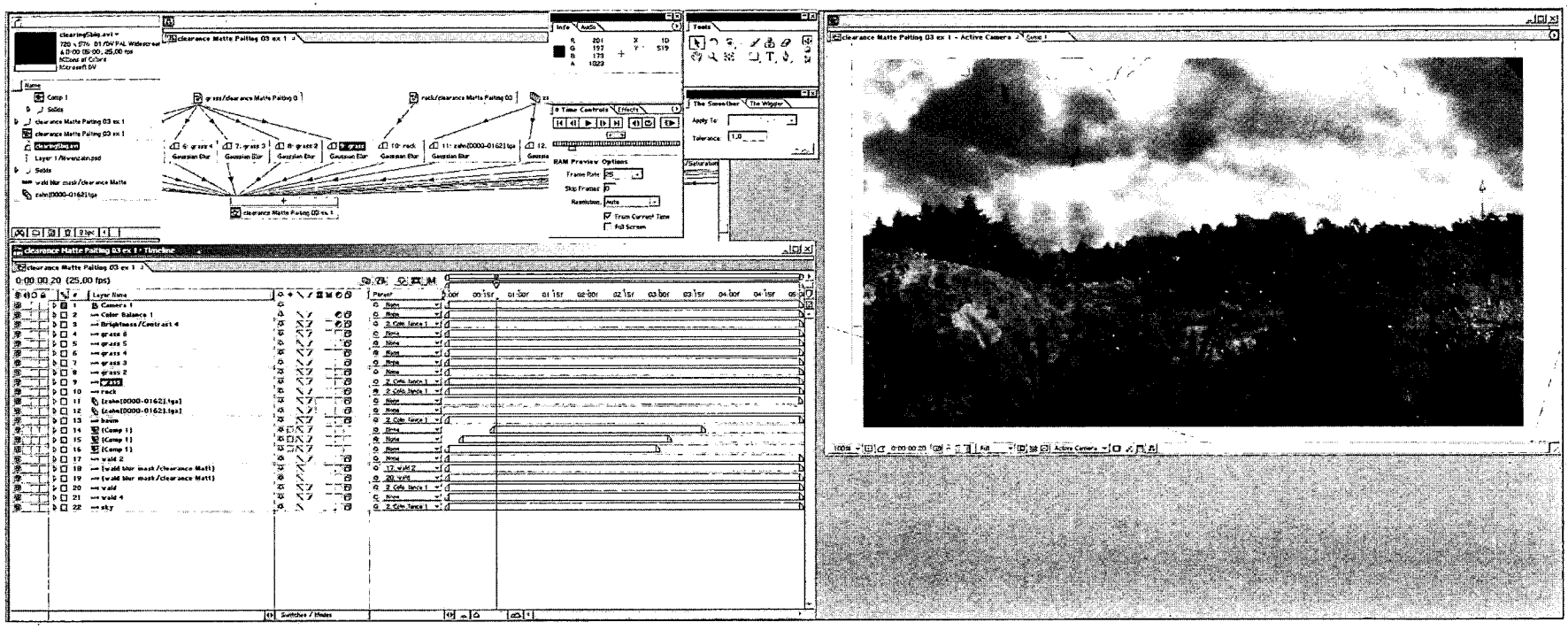

Adobe *After Effects* interface

SCREEN GRAB CONTRIBUTED BY LEV MANOVICH

AFTER EFFECTS OR THE VELVET REVOLUTION

LEV MANOVICH

During the heyday of post-modern debates, at least one critic in America noticed the connection between post-modern pastiche and computerization. In his book *After the Great Divide* (1986), Andreas Huyssen writes: "All modern and avantgardist techniques, forms and images are now stored for instant recall in the computerized memory banks of our culture. But the same memory also stores all of pre-modernist art as well as the genres, codes, and image worlds of popular cultures and modern mass culture."[1] His analysis is accurate—except that these "computerized memory banks" did not really become commonplace for another fifteen years. Only after the Web absorbed enough of the media archives did it become this universal cultural memory bank accessible to all cultural producers. But even for the professionals, the ability to easily integrate multiple media sources within the same project—multiple layers of video, scanned still images, animation, graphics, and typography—only came towards the end of the 1990s.

In 1985 when Huyssen's book was in preparation for publication I was working for Digital Effects, one of the few computer animation companies in the world.[2] Each computer animator had his own interactive graphics terminal that could show 3D models but only in monochrome wireframe; to see them fully rendered in color, we had to take turns, as the company had only one color raster display which we all shared. The data was stored on bulky magnetic tapes about a foot in diameter; to find the data from an old job was a cumbersome process which involved locating the right tape in the tape library, putting it on a tape drive and then searching for the right part of the tape. We did not have a color scanner, so getting "all modern and avantgardist techniques, forms and images" into the computer was far from trivial. And even if we had one, there was no way to store, recall and modify these images. The machine that could do that—Quantel Paintbox—cost over $160,000, which we could not afford. And when in 1986 Quantel introduced Harry, the first commercial non-linear editing system which allowed for digital compositing of multiple layers of video and special effects, its cost similarly made it prohibitive for everybody except network television stations and a few production houses. Harry could record only eighty seconds of broadcast quality video. In the

[1] Andreas Huyssen, "Mapping the Postmodern," *After the Great Divide* (Bloomington and Indianapolis: Indiana University Press, 1986), p. 196.

[2] See Wayne Carlson, *A Critical History of Computer Graphics and Animations. Section 2: The Emergence of Computer Graphics Technology* <http://accad.osu.edu/%7Ewaynec/history/lesson2.html>.

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realm of still images, things were not much better: for instance, the digital still store Picturebox, released by Quantel in 1990, could hold only 500 broadcast quality images and its cost was also very high.

In short, in the middle of the 1980s, neither Digital Effects nor other production companies had anything approaching the "computerized memory banks" imagined by Huyssen. And of course, the same was true for the visual artists that were then associated with post-modernism and the ideas of pastiche, collage and appropriation. In 1986 BBC produced the documentary *Painting with Light* for which half a dozen well-known painters including Richard Hamilton and David Hockney were invited to work with the Quantel Paintbox. The resulting images were not so different from normal paintings that these artists were producing without a computer. And while some artists were making references to "modern and avantgardist techniques, forms and images," these references were painted rather than being directly loaded from "computerized memory banks." Only in the middle of the 1990s, when relatively inexpensive graphics workstations and personal computers running image editing, animation, compositing and illustration software became commonplace and affordable for freelance graphic designers, illustrators, and small post-production and animation studios, did the situation described by Huyssen start to become a reality.

The results were dramatic. Within about five years, modern visual culture was fundamentally transformed. Previously separate media—live action cinematography, graphics, still photography, animation, 3D computer animation, and typography—started to be combined in numerous ways. By the end of the decade, "pure" moving image media became an exception and hybrid media became the norm. However, in contrast to other computer revolutions, such as the rise of World Wide Web around the same time, this revolution was not acknowledged by popular media or by cultural critics. What received attention were the developments that affected narrative filmmaking—the use of computer-produced special effects in Hollywood feature films, or the inexpensive digital video and editing tools outside of it. But another process which happened on a larger scale—the transformation of the visual language used by all forms of moving images outside of narrative films—has not been critically analyzed. In fact, while the results of these transformations had become fully visible by about 1998, at the time of this writing (spring 2006) I am not aware of a single theoretical article discussing them in detail.[3]

One of the reasons is that in this revolution no new media per se were created. Just as ten years ago, the designers were making

[3] An early relevant publication is Grahame Weinbren, "The Digital Revolution is a Revolution of Random Access," Telepolis, 17.2.1997 (http://www.heise.de/tp/).

still images and moving images. But the aesthetics of these images was now very different. In fact, it was so new that, in retrospect, the post-modern imagery of just ten years ago that at the time looked strikingly different now appears as a barely noticeable blip on the radar of cultural history.

Visual Hybridity

This article is a first part of a series devoted to the analysis of the new hybrid visual language of moving images that emerged during the period 1993-1998. Today this language dominates our visual culture. While narrative features mostly stick to live cinematography, and video shot by ordinary people with consumer video cameras and cell phones is usually left as is, everything else—commercials, music videos, motion graphics, TV graphics, and other types of short non-narrative films and moving image sequences being produced around the world by the media professionals including companies, individual designers and artists, and students—is hybrid.

Of course, I could have picked a different period, for instance starting a few years earlier—but since the After Effects software, which will play the key role in my account, was released in 1993, I made that year the start of the period. And by 1998 the broad changes in the aesthetics of moving image were visible. If you want to quickly see this for yourself, simply compare demo reels from the same visual effects companies made in the early and late 1990s (a number of them are available online, for instance the work of Pacific Data Images.[4]) In the work from the beginning of the decade, computer imagery in most cases appears by itself—that is, we see whole commercials and promotional videos done in 3D computer animation, and the novelty of this new medium is foregrounded. By the end of the 1990s, computer animation becomes just one element integrated in the media mix that also includes live action, typography, and design.

[4] http://accad.osu.edu/~waynec/history/lesson6.html.

Although these transformations happened only recently, the ubiquity of the new hybrid visual language today (2006) is such that it takes an effort to recall how different things looked before. Similarly, the changes in production processes and equipment that made this language possible also quickly faded from both the public and professional memory. To quickly evoke these changes as seen from the professional perspective, I am going to quote from a 2004 interview with Mindi Lipschultz who has worked as an editor, producer and director in Los Angeles since 1979:

> If you wanted to be more creative [in the 1980s], you couldn't just add more software to your system. You had to spend hundreds of

> thousands of dollars and buy a Paintbox. If you wanted to do something graphic—an open to a TV show with a lot of layers—you had to go to an editing house, and spend over a thousand dollars an hour to do the exact same thing you do now by buying an inexpensive computer and several software programs. Now with Adobe After Effects and Photoshop, you can do everything in one sweep. You can edit, design, animate. You can do 3D or 2D all on your desktop computer at home or in a small office.[5]

[5] Mindi Lipschultz, interviewed by The Compulsive Creative, May 2004 <http://www.compulsivecreative.com/interview.php?intid=12>.

In 1989 former Soviet satellites of Central and Eastern Europe peacefully liberated themselves from the Soviet Union. In the case of Czechoslovakia, this event came to be referred as the Velvet Revolution—to contrast it to typical revolutions in modern history that were always accompanied by bloodshed. To emphasize the gradual, almost invisible pace of the transformations that occurred in moving image aesthetics between approximately 1993 and 1998, I am going to appropriate the term "Velvet Revolution" to refer to this transformation. Therefore, this series of articles can be subtitled *A Velvet Revolution in Moving Image Culture*. Although it may seem presumptuous to compare political and aesthetic transformations simply because they share the same non-violent quality, as we will see in a later article, the two revolutions are actually related. But we can only make this connection after we analyze in detail how the aesthetics and the very logic of moving images changed during this period.

Although the Velvet Revolution I will be discussing involved many technological and social developments—hardware, software, production practices, new job titles and new professional fields—it is appropriate to highlight one software package as being in the center of the events. Introduced in 1993, After Effects was the first software designed to do animation, compositing, and special effects on the personal computer.[6] Its broad effect on moving image production can be compared to the effects of Photoshop and Illustrator on photography, illustration, and graphic design. Although today (2006) media design and post-production companies continue to rely on more expensive "high-end" software such as Flame, Inferno or Paintbox that run on specialized graphics workstations from SGI, because of its affordability and length of time on the market, After Effects is the most popular and well-known application in this area. Consequently, After Effects will be given a privileged role in this text as both the symbol and the key material foundation which made Velvet Revolution in moving image culture possible—even though today other programs in the similar price category such as Apple's Motion and Autodesk's Combustion have challenged After Effects' dominance.

[6] Actually, The NewTek Video Toaster released in 1990 was the first PC based video production system that included a video switcher, character generation, image manipulation, and animation. Because of their low costs, Video Toaster systems were extremely popular in the 1990s. However, in the context of my article, After Effects is more important because, as I will explain below, it introduced a new paradigm for moving image design that was different from the familiar video editing paradigm supported by systems such as Toaster.

Finally, before proceeding, I should explain the use of examples in this article. The visual language I am analyzing is all around us today. This language is spoken by all communication professionals around the world. You can see for yourself all the examples of various aesthetics I will mention below by simply watching television in practically any country and paying attention to graphics, or going to a club to see a VJ performance, or visiting the web sites of motion graphics designers and visual effects companies, or opening any book on contemporary design. Nevertheless, I have included references to particular projects below so the reader can see exactly what I am referring to.[7] But since my goal is to describe the new cultural language, which by now has become practically universal, I want to emphasize that each of these examples can be substituted by numerous others.

[7] I have drawn these examples from three published sources so they are easy to trace. The first is a DVD *I Love Music Videos* that contains a selection of forty music videos for well-known bands from the 1990s and early 2000s, published in 2002. The second is an *onedotzero_select DVD*, a selection of sixteen independent short films, commercial work and a Live Cinema performance presented by onedotzero festival in London and published in 2003. The third is Fall 2005 sample work DVD from Imaginary Forces, which is among most well known motion graphics production houses today. The DVD includes titles and teasers for feature films, and the TV shows titles, stations IDs and graphics packages for cable channels. Most of the videos I am referring to can be also found on the net.

Examples

The use of After Effects is closely identified with a particular type of moving image which became commonplace to a large part because of this software—"motion graphics." Concisely defined by Matt Frantz in his Master's Thesis as "designed non-narrative, non-figurative based visuals that change over time,"[8] "motion graphics" today includes film and television titles, TV graphics, dynamic menus, the graphics for mobile media content, and other animated sequences. Typically, motion graphics appear as parts of longer pieces: commercials, music videos, training videos, narrative and documentary films, interactive projects.

[8] Matt Frantz (2003), "Changing Over Time: The Future of Motion Graphics" <http://www.mattfrantz.com/thesisandresearch/motiongraphics.html>.

While motion graphics definitely exemplify the changes that took place during the Velvet Revolution, these changes are broader. Simply put, the result of the Velvet Revolution is *a new hybrid visual language of moving images in general.* This language is not confined to particular media forms. And while today it manifests itself most clearly in non-narrative forms, it is also often present in narrative and figurative sequences and films.

For example, a music video may use live action while also employing typography and a variety of transitions done with computer graphics (example: video for "Go" by Common, directed by Convert / MK12 / Kanye West, 2005). Or it may imbed the singer within the animated painterly space (video for Sheryl Crow's "Good Is Good," directed by Psyop, 2005.) A short film may mix typography, stylized 3D graphics, moving design elements, and video (*Itsu* for Plaid, directed by Pleix collective, 2002[9]).

In some cases, the juxtaposition of different media is clearly visible (examples: music video for "Don't Panic" by Coldplay; main title for "The Inside" by Imaginary Forces, 2005). In other cases, a sequence may move between different media so quickly

[9] Included on *onedotzero_select DVD 1*. Online version at <http://www.pleix.net/films.html>.

that the shifts are barely noticeable (GMC Denali "Holes" commercial by Imaginary Forces, 2005). Yet in other cases, a commercial or a movie title may feature continuous action shot on video or film, with the image being periodically changing from a more natural to a highly stylized look.

While the particular aesthetic solutions vary from one piece to the next and from one designer to another, they all share the same logic: the appearance of multiple media simultaneously in the same frame. Whether these media are openly juxtaposed or almost seamlessly blended together is less important than the fact of this co-presence itself.

Today such hybrid visual language is also common to a large proportion of short "experimental" (i.e., non-commercial) films being produced for media festivals, the web, mobile media devices, and other distribution platforms.[10] The large percentage of the visuals created by VJs and Live Cinema artists are also hybrid, combining video, layers of 2D imagery, animation, and abstract imagery generated in real time. (For examples, consult *The VJ book*, *VJ: Live Cinema Unraveled*, or web sites such as www.vjcentral.com and www.live-cinema.org.[11]) In the case of feature narrative films and TV programs, while they still rarely mix different graphical styles within the same frame, many now feature highly stylized aesthetics which would previously be identified with illustration rather than filmmaking—for instance, the TV series *CSI*, George Lucas' latest *Star Wars* films, or Robert Rodriguez's *Sin City*.

Media Remixability

What is the logic of this new hybrid visual language? *This logic is one of remixability: not only of the content of different media or simply their aesthetics, but their fundamental techniques, working methods, and assumptions.* United within the common software environment, cinematography, animation, computer animation, special effects, graphic design, and typography have come to form a new "metamedium." A work produced in this new metamedium can use all techniques which were previously unique to these different media, or any subset of these techniques.

If we use the concept of "remediation" to describe this new situation, we will misrepresent this logic—or the logic of media computing in general.[12] The computer does not "remediate" particular media. Rather, *it simulates all media.* And what it simulates are not surface appearances of different media but all the techniques used for their production and all the methods of viewing and interaction with the works in these media.

[10] In December 2005 I attended the Impact Media Festival in Utrecht and I asked the festival director what percentage of submissions they received this year featured hybrid visual language as opposed to "straight" video or film. His estimate was about one half. In January 2006, I was part of the review team that judged graduating projects of students in SCI-ARC, a well-known research-oriented architecture school in Los Angeles. According to my informal estimate, approximately half the projects featured complex curved geometry made possible by *Maya*, a modeling software now commonly used by architects. Given that both *After Effects* and *Maya*'s predecessor *Alias* were introduced the same year–1993–I think that this quantitative similarity in the proportion of projects that use new languages made possible by these software is quite telling.

[11] Paul Spinrad, ed., *The VJ Book: Inspirations and Practical Advice for Live Visuals Performance* (Feral House, 2005); Timothy Jaeger, *VJ: Live Cinema Unraveled* (available from www.vj-book.com).

[12] Jay David Bolter and Richard Grusin, *Remediation: Understanding New Media* (The MIT Press, 1999).

Once all types of media met within the same digital environment—and this was accomplished by the middle of the 1990s—they started interacting in ways that could never be predicted nor even imagined previously. For instance, while particular media techniques continue to be used in relation to their original media, they can also be applied to other media. (This is possible because the techniques are turned into algorithms, all media is turned into digital data stored in compatible file formats, and software is designed to read and write files produced by other programs.) Here are a few examples: motion blur is applied to 3D computer graphics, computer generated fields of particles are blended with live action footage to give it an enhanced look, a virtual camera is made to move around the virtual space filled with 2D drawings, flat typography is animated as though it is made from a liquid-like material (the liquid simulation coming from the computer graphics field), and so on. And while this "cross-over" use by itself constitutes a fundamental shift in media history, today a typical short film or a sequence may combine many such pairings within the same frame. The result is a hybrid, intricate, complex, and rich visual language—or rather, numerous languages that share the basic logic of remixabilty.

I believe that this "media remixability," which began around the middle of the 1990s, constitutes a new fundamental stage in the history of media. It manifests itself in different areas of culture and not only in moving images—although the latter does offer a particularly striking example of this new logic at work. Here software such as After Effects became a Petri dish where computer animation, live cinematography, graphic design, 2D animation and typography started to interact together, creating new hybrids. And as the examples mentioned above demonstrate, the results of this process of remixability are a new aesthetics and a new species of media that cannot be reduced to the sum of media that went into them. Put differently, the interactions of different media in the same software environment are cultural species.

Media remixability does not necessary lead to a collage-like aesthetics which foregrounds the juxtapositions of different media and different media techniques. As a very different example of what media remixability can result in, consider a more subtle aesthetics well captured by the name of the software under discussion—After Effects. If in the 1990s computers were used to create highly spectacular special effects or "invisible effects,"[13] by the end of this decade we see something else emerging: a new visual aesthetics which goes "beyond effects." In this aesthetics, the whole project—music video, commercial, short film, or a large part of a feature film—displays a hyper-real

[13] An invisible effect is the standard industry term. For instance, in 1997 the film *Contact* directed by Robert Zemeckis was nominated for the1997 VFX HQ Awards in the following categories: Best Visual Effects, Best Sequence ("The Ride"), Best Shot ("Powers of Ten"), Best Invisible Effects ("Dish Restoration") and Best Compositing. <www.vfxhq.com/1997/contact.html>

look where the enhancement of live action material is not completely invisible but at the same time it does not call attention to itself the way special effects usually did (examples: Reebok I-Pimp *Black Basketball* commercial, *The Legend of Zorro* main title, both by Imaginary Forces, 2005.) This new hyper-real aesthetics is yet another example of how in the hands of designers the Petri dish of software containing all media creation and manipulation techniques developed during human history is now producing new hybrids.

Layers, Transparency, Compositing

Let us now look at the details of a new visual language of moving images which emerged from the Velvet Revolution and the material and social conditions—software, user interface, design workflow—which make media remixability possible. Probably the most dramatic of the changes that took place during 1993-1998 was the new ability to combine multiple levels of imagery with varying degrees of transparency via digital compositing. Comparing a typical music video or a TV advertising spot circa 1986 with their counterparts circa 1996 reveals striking differences. (The same holds for still images.) As I already noted, in 1986 "computerized memory banks" were very limited in their storage capacity and prohibitively expensive, and therefore designers could not quickly and easily cut and paste multiple image sources. But even when they would assemble multiple visual references, a designer only could place them next to, or on top of each other. She could not modulate these juxtapositions by adjusting transparency levels of different images. Instead, she had to resort to the same photocollage techniques popularized in the 1920s. In other words, the lack of transparency restricted the number of different image sources that can be integrated within a single composition without it starting to look like the photomontages of John Heartfield, Hannah Hoch, or Robert Rauschenberg—a mosaic of fragments without any strong dominant.[14]

Compositing also made trivial another operation which was very cumbersome. Until the 1990s, different media types such as hand-drawn animation, lens-based recordings, i.e., film and video, and typography practically never appeared within the same frame. Instead, animated commercials, publicity shorts, industrial films, and some feature and experimental films that did include multiple media usually placed them in separate shots. A few directors managed to build whole aesthetic systems out of such temporal juxtapositions—most notably, Jean-Luc Godard. In his 1960s films, such as *Week-end* (1967), Godard cut bold typographic compositions between live action scenes creating

[14] In the case of video, one of the main reasons which made combining multiple visuals difficult was the rapid degradation of the video signal when an analog video tape was copied more than a couple of times. Such a copy would no longer meet broadcasting standards.

what can be called "media montages." In the same period, pioneering motion graphics designer Pablo Ferro, who has appropriately called his company Frame Imagery, created promotional shorts and TV graphics that played on juxtapositions of different media replacing each other in rapid succession.[15] In a number of Ferro's spots, static images of different letterforms, line drawings, original hand painted artwork, photographs, very short clips from newsreels, and other visuals would appear one after another with machine-gun speed.

[15] Jeff Bellantfoni and Matt Woolman, *Type in Motion* (Rizzoli, 1999), pp. 22-29.

Within cinema, the superimposition of different media within the same frame was usually limited to the two media placed on top of each other in a standardized manner—i.e., static letters appearing on top of still or moving lens-based images in feature film titles. Both Ferro and another motion graphics pioneer, Saul Bass, created a few title sequences where visual elements of different origins were systematically overlaid together—such as the opening of Hitchcock's *Vertigo*, designed by Bass (1958). But I think it is fair to say that such complex juxtapositions of media within the same frame (rather than in edited sequence) were exceptions in the otherwise "unimedia" universe where filmed images appeared in feature films and hand drawn images appeared in animated films. The only twentieth century feature film director I know of who has built his unique aesthetics by systematically combining different media within the same shot is Czech Karel Zeman. A typical shot by Zeman may contain filmed human figures, an old engraving used for background, and a miniature model.[16] Some experimental filmmakers have also explored the possibilities of mixing different media together—for instance, The Whitneys and Pat O'Neill, who since the late 60s has been combining all kinds of material into his films using the optical printer—models, real time material, time lapse, type, appropriated graphic images, found footage, and animation.[17]

[16] Of course, while special effects in feature films often combined different media, they were used together to create a single illusionistic space, rather than juxtaposed for the aesthetic effect such as in films and titles by Godard, Zeman, Ferro and Bass.

[17] I am grateful to Grahame Weinbren who pointed out to me that the work of Pat O'Neill is relevant to my argument.

The achievements of these directors and designers are particularly remarkable given the difficulty of combing different media within the same frame during the film era. To do this required utilizing the services of a special effects departments or separate companies which used optical printers. The techniques that were cheap and more accessible, such as double exposure, were limited in their precision. So while a designer of static images could at least cut and paste multiple elements within the same composition to create a photomontage, to create the equivalent effect with moving images was far from easy.

To put this in general terms, we can say that before the computerization of the 1990s, the designer's capacities to access, manipulate, remix, and filter visual information, whether still or

moving, were quite restricted. In fact, they were practically the same as a hundred years earlier—regardless of whether filmmakers and designers used in-camera effects, optical printing, or video keying. In retrospect, we can see they were at odds with the flexibility, speed, and precision of data manipulation already available to most other professional fields which by that time were computerized—sciences, engineering, accounting, management, etc. Therefore, it was only a matter of time before all image media would be turned into digital data and illustrators, graphic designers, animators, film editors, video editors, and motion graphics designers start manipulating them via software instead of their traditional tools. But this is only obvious today—after the Velvet Revolution has taken place.

In 1985 Jeff Stein directed a music video for the new wave band Cars. This video had a big effect in the design world, and MTV gave it the first prize in its first annual music awards.[18] Stein managed to create a surreal world in which a video cutout of the singing head of the band member was animated over different video backgrounds. In other words, Stein took the aesthetics of animated cartoons—2D animated characters superimposed over a 2D background—and recreated it using video imagery. In addition, simple computer animated elements were also added in some shots to enhance the surreal effect. This was shocking because nobody ever saw such juxtapositions before. Suddenly, modernist photomontage came alive. But ten years later, such moving video collages not only became commonplace, but they also became more complex, more layered, and more subtle. Instead of two or three, a composition could now feature hundreds and even thousands of layers. And each layer could have its own level of transparency.

[18] See <dreamvalley-mlp.com/cars/vid_heartbeat.html#you_might>.

In short, digital compositing now allowed the designers to easily mix any number of visual elements regardless of the media in which they originated and to control each element in the process. We can make an analogy between multitrack audio recording and digital compositing of moving images. In multitrack recording, each sound track can be manipulated individually to produce the desired result. Similarly, in digital compositing each visual element can be independently modulated in a variety of ways: resized, recolored, animated, etc. Just as the music artist can focus on a particular track while muting all other tracks, a designer can turn off all visual tracks except the one she is currently adjusting. Similarly, both a music artist and a designer can at any time substitute one element of a composition for another, delete any elements, and add new ones. Most importantly, just as multitrack recording redefined the sound of popular music from the 1960s on, once digital compositing became widely available

during the 1990s, it changed the visual aesthetics of moving images in popular culture.

This brief discussion has only scratched the surface of my subject in this section, i.e., layers and transparency. For instance, I have not analyzed the actual techniques of digital compositing and the fundamental concept of an alpha channel which deserves a separate and detailed treatment. I have also not gone into the possible media histories leading to digital compositing, nor its relationship to optical printing, video keying and video effects technology of the 1980s. These histories and relationships were discussed in the "Compositing" chapter (written in 1999) of *The Language of New Media*, but from a different perspective than the one used here. At that time I was looking at compositing in order to pose questions about cinematic realism, practices of montage, and the construction of special effects in feature films. Today, however, it is clear to me that in addition to disrupting the regime of cinematic realism in favor of other visual aesthetics, compositing also had another, even more fundamental effect.

By the end of the 1990s digital compositing had become the basic operation used in creating *all* forms of moving images, and not only big budget features. So while compositing was originally developed in the context of special effects production in the 1970s and early 1980s[19], it has had a much broader effect on contemporary visual and media cultures. Compositing played the key part in turning the digital computer into an experimental lab where different media can meet and where their aesthetics and techniques can be combined to create a new species. In short, digital compositing was essential in enabling the development of a new hybrid visual language of moving images that we see everywhere today.

[19] Thomas Porter and Tom Duff, "Compositing Digital Images," ACM *Computer Graphics* vol. 18, no. 3 (July 1984): pp. 253-259.

Thus, compositing that was at first a particular digital technique designed to integrate two particular media of live action film and computer graphics has become a "universal media integrator." And although compositing was originally created to support the aesthetics of cinematic realism, over time it actually had an opposite effect. Rather than forcing different media to fuse seamlessly, compositing led to the flourishing of numerous media hybrids where the juxtapositions between live and algorithmically-generated, two dimensional and three dimensional, raster and vector are made deliberately visible rather than being hidden.

From "Time-based" to a "Composition-based"

My thesis about media remixability applies both to the cultural forms and the software used to create them. Just as the moving image media made by designers today mix formats, assump-

tions, and techniques of different media, the toolboxes and interfaces of the software they use are also remixes. Let us again use After Effects as the case study to see how its interface remixes previously distinct working methods of different disciplines.

When moving image designers started to use compositing/animation software, the interfaces encouraged them to think about moving images in a fundamentally new way. Film and video editing systems and their computer simulations that came to be known as non-linear editors (today exemplified by Avid and Final Cut[20]) have conceptualized a media project as a sequence of shots organized in time. NLE (the standard abbreviation for non-linear editing software) gave the editor many tools for adjusting the edits. However, the constant of film language, as it developed from its industrial uses, was taken for granted: i.e., all frames should have the same size and aspect ratio. This is an example of a larger phenomenon: as physical media were simulated in a computer, often many of their fundamental properties, interface conventions and constraints were methodically re-created in software—even though software itself has no such limitations. In contrast, from the beginning the After Effects interface put forward a new concept of moving image—as a composition organized both in time and 2D space.

[20] I should note that compositing functionality was gradually added over time to most NLE, so today the distinction between original After Effects or Flame interfaces and Avid and Final Cut interfaces is less pronounced.

The center of this interface is a "Composition" window conceptualized as a large canvas that can contain visual elements of arbitrary sizes and proportions. When I first started using After Effects, soon after it came out, I remember feeling shocked that the software did not automatically resize the graphics I dragged into the Composition window to make them fit the overall frame. The fundamental assumption of cinema that accompanied it throughout its whole history—that film consists of many frames which all have the same size and aspect ratio—was gone.

In film and video editing paradigms of the twentieth century, the minimal unit on which the editor works on is a frame. She can change the length of an edit, adjusting where one film or video segment ends and another begins, but she cannot interfere with the contents of a frame. The frame as a whole functions as a kind of "black box" that cannot be "opened." This was the job for special effects departments. But in the After Effects interface, the basic unit is not a frame but a visual element placed in the Composition window. Each element can be individually accessed, manipulated and animated. In other words, each element is conceptualized as an independent object. Consequently, a media composition is understood as a set of independent objects that can change over time. The very word "composition" is important in this context as it references 2D media (drawing,

painting, photography, design) rather than filmmaking—i.e., space as opposed to time.

Where does the After Effects interface come from? Given that this software is commonly used to create animated graphics (i.e., "motion graphics") and visual effects, it is not surprising that we can find interface elements that can be traced to three separate fields: animation, graphic design, and special effects. In traditional cell animation practice, an animator places a number of transparent cells on top of each other. Each cell contains a different drawing—for instance, a body of a character on one cell, the head on another cell, eyes on the third cell. Because the cells are transparent, the drawings are automatically "composited" into a single composition. While the After Effects interface does not use the metaphor of a stack of transparent cells directly, it is based on the same principle. Each element in the Composition window is assigned a "virtual depth" relative to all other elements. Together all elements form a virtual stack. At any time, the designer can change the relative position of an element within the stack, delete it, or add new elements.

We can also see a connection between the After Effects interface and stop motion that was another popular twentieth century animation technique. With stop motion technique, puppets or any other objects are positioned in front of a camera and manually animated one frame at a time. The animator exposes one frame of film, changes the objects a tiny bit, exposes another frame, and so on.

Just as it was the case with both cell and stop-motion animation, After Effects does not make any assumptions about the size or positions of individual elements. Rather than dealing with standardized units of time, i.e., film frames containing fixed visual content, a designer now works with separate visual elements positioned in space and time. An element can be a digital video frame, a line of type, an arbitrary geometric shape, etc. The finished work is the result of a particular arrangement of these elements in space and time. In this paradigm we can compare the designer to a choreographer who creates a dance by "animating" the bodies of dancers—specifying their entry and exit points, trajectories through space of the stage, and the movements of their bodies. (In this respect it is relevant that while the After Effects interface did not evoke this reference, Macromedia Director, which was the key multimedia authoring software in the 1990s did directly use the metaphor of the theater stage.)

While we can link the After Effects interface to traditional animation methods as used by commercial animation studios, the working method put forward by software is closer to graphic design. In commercial animation studios of the twentieth centu-

ry, all elements—drawings, sets, characters, etc.—were prepared beforehand. The filming itself was a mechanical process. Of course, we can find exceptions to this industrial-like separation of labor in experimental animation practice where a film was typically produced by one person. For instance, in 1947 Oskar Fischinger made an eleven-minute film, *Motion Painting 1*, by continuously modifying a painting and exposing film one frame at a time after each modification. However, because Fischinger was shooting on film, he had to wait a long time before seeing the results of his work. As the historian of abstract animation William Moritz writes, "Fischinger painted every day for over five months without being able to see how it was coming out on film, since he wanted to keep all the conditions, including film stock, absolutely consistent in order to avoid unexpected variations in quality of image."[21] In other words, in the case of this project by Fischinger, creating a design and seeing the result were even more separated than in a commercial animation process.

[21] Qtd. in Michael Barrier, *Oskar Fischinger. Motion Painting No. 1* <www.michaelbarrier.com/Capsules/Fischinger/fischinger_capsule.htm>.

In contrast, a graphic designer works "in real time." As the designer introduces new elements, adjusts their locations, colors and other properties, tries different images, changes the size of the type, and so on, she can immediately see the result of her work.[22] After Effects simulates this working method by making the Composition window the center of its interface. Like a traditional designer, an After Effects user interactively arranges the elements in this window and can immediately see the result. In short, the After Effects interface makes filmmaking into a design process, and a film is re-conceptualized as a graphic design that can change over time.

[22] While the graphic designer does not have to wait until film is developed or a computer finished rendering the animation, graphic design has its own "rendering" stage–making proofs. With both digital and offset printing, after the design is finished, it is sent to the printer that produces the test prints. If the designer finds any problems such as incorrect colors, she adjusts the design and then asks for proofs again.

When physical media are simulated in a computer, we do not simply end up with the same media as before. By adding new properties and working methods, computer simulation fundamentally changes the identity of given media. For example, in the case of "electronic paper," such as a Word document or a PDF file, we can do many things which were not possible with ordinary paper: zoom in and out of the document, search for a particular phrase, change fonts and line spacing, etc. Similarly, current (2006) online interactive maps services provided by Mapquest, Yahoo, and Google augment the traditional paper map in multiple and amazing ways—just take a look at Google Earth.[23]

[23] <http://earth.google.com/>.

A significant proportion of contemporary software for creating, editing, and interacting with media developed by simulating a physical media and augmenting it with new properties. But if we consider media design software such as Maya (used for 3D modeling and computer animation) or After Effects we encounter

a different logic. These software applications *do not simulate any single physical media that existed previously*. Rather, they *borrow from a number of different media combining and mixing their working methods and specific techniques*. (And, of course, they also add new capabilities specific to the computer—for instance, the ability to automatically calculate the intermediate values between a number of keyframes.) For example, 3D modeling software mixes techniques that previously were "hard-wired" to different physical media: the ability to change the curvature of a rounded form as though it is made from clay, the ability to build a structure from simple geometric primitives the way a house can be built from identical rectangular building blocks, etc.

Similarly, as we saw, After Effects' original interface, toolkit, and workflow drew on the techniques of animation and the techniques of graphic design. (We can also find traces of filmmaking and 3D computer graphics.) But the result is not simply a mechanical sum of all elements that came from earlier media. Rather, as software remixes the techniques and working methods of the various media they simulate, the results are new interfaces, tools and workflow with their own distinct logic. In the case of After Effects, the working method it establishes is neither animation nor graphic design nor cinematography, even though it draws from all these areas. It is a new way to make moving image media. Similarly, the visual language of media produced with this and similar software is also different from earlier languages of moving images.

In other words, the Velvet Revolution unleashed by After Effects and other software did not simply make more commonplace the animated graphics artists and designers—John and James Whitney, Norman McLaren, Saul Bass, Robert Abel, Harry Marks, R/Greenberg, and others—were already creating, using stop motion animation, optical printing, video effects hardware of the 1980s, and other custom techniques and technologies. Instead, it led to the emergence of numerous new visual aesthetics that did not exist before. This article only begins the discussion of the common logic shared by these aesthetics; subsequent articles will look at its other features.

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